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[0001] METHOD FOR DISTRIBUTION OF WIRELESS TRANSMIT/RECEIVE UNIT (WTRU) CAPABILITY BETWEEN POINT TO POINT AND POINT TO MULTIPOINT SERVICES

[0002] CROSS REFERENCE TO RELATED APPLICATION(S)

[0003] This application claims priority from U.S. Provisional Application No. 60/446,716 filed on February 11, 2003, which is incorporated by reference as if fully set forth herein.

[0004] FIELD OF INVENTION

[0005] This invention generally relates to wireless transmit/receive unit (WTRU) capability, and more particularly to a method for distribution of WTRU capability between point to point (PtP) and point to multipoint (PtM) services.

[0006] BACKGROUND

[0007] It is generally known that WTRU capabilities identify transport and physical processing abilities. Transport capabilities define transport channel attributes such as the number of transmitted bits per frame, the number of different combinations of bits allowed, and other similar parameters. Physical capabilities define the number and types of physical channels including parameters such as allowed spreading factors and other similar parameters.

[0008] For PtP services, it is noted that radio bearers (RBs) are controlled by the serving radio network controller (S-RNC). The S-RNC coordinates RB establishment, data transmission, release and maintenance of the quality of service (QoS).

[0009] In advance of establishment of PtP RBs, the WTRU signals its capabilities to the S-RNC. Physical resources are determined by the controlling RNC (C-RNC) and,

for proper determination of physical resources, the S-RNC then relays the capability information to the C-RNC.

[0010] For PtM services, RBs are managed by the C-RNC. Similar to the PtP case, the C-RNC coordinates establishment, transmission, and release of PtM RBs. For proper configuration of PtM transport and physical channels, it is necessary to know the PtM capabilities of the WTRU associated with the PtM service. It is therefore necessary to define procedures that provide this information to the C-RNC.

[0011] Since PtP and PtM services can exist simultaneously, it is necessary to coordinate transmission of these services so that WTRU capabilities are used efficiently and not exceeded.

[0012] Some WTRUs will not have the capability to receive both PtP and PtM services simultaneously, and other WTRUs will have to distribute capabilities between these service types. It is therefore necessary and desirable to coordinate the assignment of WTRU capabilities between the PtP and PtM services. Additionally, since PtP services are managed by the S-RNC and PtM services are managed by the C-RNC, it is desirable to have procedures in place to coordinate the use of WTRU capabilities between the two aforementioned types of RNCs.

[0013] SUMMARY

[0014] The invention provides a method of arranging WTRU capability distribution between PtP and PtM services, and describes different scenarios to coordinate establishment and distribution of WTRU PtP/PtM capabilities within a Universal Mobile Telecommunication System Terrestrial Radio Access Network (UTRAN), as an example. The invention also provides different scenarios for management of PtP/PtM services to enhance efficiencies of a communications network providing PtP and PtM services not heretofore obtainable employing conventional techniques.

[0015] PtM/PtP specific or common capabilities shared between PtM and PtP include:

[0016] To coordinate WTRU capabilities between PtM and PtP services, independent capabilities may be identified specific for each service. New PtM capabilities are added to the existing PtP capabilities. To limit the number of PtP/PtM combinations, an index can be specified to indicate certain preferred combinations of PtM and PtP capabilities.

[0017] An indicator may also be specified in WTRU capabilities if both PtM and PtP services can be received simultaneously or not. In the case where PtM and PtP cannot be received simultaneously, the PtM and PtP independent capabilities are mutually exclusive lists.

[0018] In the case of common PtM and PtP capabilities that are shared between PtP and PtM services, the S-RNC and C-RNC coordinate the distribution of capabilities between PtP and PtM services. When simultaneous support of PtP and PtM services is not indicated, the WTRU capabilities are dedicated either to the PtP or PtM service.

[0019] Exemplary procedures to coordinate establishment of PtP and PtM services and distribution of WTRU PtP/PtM capabilities within a UTRAN include:

[0020] In accordance with existing procedures, the S-RNC is informed of WTRU PtP and PtM capabilities upon establishment of a Radio Resource Control (RRC) Radio Access Network (RAN) connection. This embodiment of the invention provides mechanisms for identifying WTRU capabilities to the C-RNC that are available for PtM services. Additionally, procedures are defined for coordination of WTRU PtP and PtM capabilities between S-RNCs and C-RNCs when both services are active simultaneously and may establish or release asynchronously relative to each other.

[0021] The C-RNC is informed of either PtP/PtM common or PtM specific WTRU capabilities upon WTRU entry to any cell controlled by this C-RNC. This can be accomplished with modification to the existing cell update procedure when the WTRU does not have an active dedicated PtP service, with modification to the radio link (RL)

Setup procedure when a dedicated PtP service exists, and/or with an additional new procedure initiated by the C-RNC upon activation of the PtM service.

[0022] When the WTRU does not already have an established, dedicated PtP service, each time the WTRU enters a new cell or a PtM distribution area comprising more than one cell, the WTRU will initiate the existing cell update procedure. The purpose for the existing cell update procedure is to update the WTRU location and correspondingly update UTRAN routing to establish a new transmission path to the WTRU. Upon receipt of the cell update, the S-RNC determines if the WTRU has an activated PtM service and, if so, returns the PtM WTRU capability in the cell update confirmation to the C-RNC. Alternatively, the PtM WTRU capability information is provided to the C-RNC as a separate message (i.e., service activation/PtM RB setup). In either case, it is the cell update procedure that triggers the PtM capability to be signaled to the C-RNC.

[0023] BRIEF DESCRIPTION OF THE DRAWINGS

[0024] A more detailed understanding of the invention may be had from the following description of preferred embodiments, given by way of example and to be understood in conjunction with the accompanying drawings in which like elements are designated by like numerals and wherein:

[0025] Figure 1 illustrates a PtM WTRU capability procedure when entering a new cell, when no dedicated PtP service exists;

[0026] Figure 2 illustrates a scenario similar to that in Figure 1, but including activation by a separate procedure;

[0027] Figure 3 is an illustration of the PtM WTRU capability procedure upon dedicated PtP establishment and handover to cells controlled by another C-RNC with a separate procedure to establish PtM service;

[0028] Figure 4 is an illustration of the PtM WTRU capability upon dedicated PtP establishment and handover to cells controlled by another C-RNC with a single procedure;

[0029] Figure 5 is an illustration of WTRU capabilities in PtM activation with an optional subsequent capability request procedure; and

[0030] Figure 6 shows an illustration of PtM services upon PtP establishment when WTRU capabilities do not allow for simultaneous PtP/PtM support.

[0031] DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0032] Figure 1 shows an exemplary PtM WTRU capability procedure when entering a new cell, when no dedicated PtP service exists. The cell update generated by the WTRU 10, at step S1, may also be used to signal using a new cause value within the cell update message, that the initiation of the procedure is to maintain PtM service in the new cell. This indication may also identify the PtM service or services that the WTRU has activated.

[0033] The C-RNC 12, upon receipt of the cell update message, step S1, checks currently active PtM services in that cell. If a service is available in the cell for which the WTRU is activated, the C-RNC, at step S2, indicates to the S-RNC 14 the need for WTRU PtM capabilities with the cell update procedure. Alternatively, the cell update is used to just notify the S-RNC 14 that WTRU 10 has changed cells, leading to the S-RNC 14 to initiate the service. In this case, a new PtM activation message or the modification of the existing common channel resource setup procedures can be used to signal the PtM capabilities. Thus, S-RNC 14, at step S3, confirms the cell update, providing the PtM capability to C-RNC 12 which alerts WTRU 10. PtM capabilities are realized at step S4 and, at step S5, PtM service is initiated.

[0034] Figure 2 generally shows an exemplary PtM WTRU capability procedure when entering a new cell, when no dedicated PtP service exists with activation by a separate procedure. When dedicated PtP services are established in a cell, upon initial

establishment and each time the WTRU 10 enters a cell controlled by a different C-RNC 12, WTRU 10 initiates a cell update with C-RNC 12, at step S1. C-RNC 12 sends a cell update confirm to S-RNC 14, at step S2. S-RNC 14 generates an RL Setup procedure and, at step S3, determines if PtM service should be activated in the new cell and directly confirms the cell update with the WTRU 10. S-RNC 14, if desired, informs the C-RNC 12 of WTRU capabilities and PtP requirements. The PtM WTRU capability information could also be provided by S-RNC 14 to C-RNC 12 as a separate message (i.e., service activation/PtM RB setup or modification of the existing common channel resource setup message, at step S4). The C-RNC 12 determines the PtP physical resource assignment and associated WTRU capability requirements and confirms PtM activation to S-RNC 14 at step S5. Steps S6 and S7, performed by C-RNC 12, are similar to steps S4 and S5 of the Figure 1 flow diagram, whereby PtM capabilities are realized at step S6, and PtM service is initiated, at step S7. In the case of common PtP/PtM capabilities, the C-RNC 12 may calculate the remaining available WTRU capabilities for PtM services without need for additional UTRAN procedures. In the case of specific PtM capabilities, the calculation is unnecessary.

[0035] Figure 3 shows an exemplary PtM WTRU capability procedure upon dedicated PtP establishment and handover to cells controlled by another C-RNC with a separate procedure to establish PtM service. As an alternative to the scenario illustrated in Figure 2, the RL setup, initiated by S-RNC 14 at step S1 and responded to by C-RNC at step S2, may indicate PtM services that the WTRU 10 has activated. When received by the C-RNC 12, the availability of these PtM services for the cell that the WTRU has entered is verified. If a service is available in the cell for which the WTRU is activated, the C-RNC 12 indicates to the S-RNC 14 the need for WTRU PtM capabilities with, or subsequent to, the RL setup procedure. PtM activation and confirmation are performed by S-RNC 14 and C-RNC 12, at steps S3 and S4 respectively, which are respectively similar to steps S4 and S5 shown in Figure 2. A

requested handover is sent directly to WTRU 10 by S-RNC 14, at step S5. Initiation of PtM service is conveyed to WTRU 10 by C-RNC 12 at step S6.

[0036] Figure 4 shows an exemplary capability procedure upon dedicated PtP establishment and handover to cells controlled by another C-RNC 12 with a single procedure. More specifically, the routine of Figure 4 addresses the case for initial PtM service establishment.

[0037] When PtM services need to be established, the S-RNC 14, at step S1, informs the C-RNC 12 of the PtM capabilities of WTRU 10 in the service activation, to which the C-RNC 12 responds with an RL Setup response, at step S2. Alternatively, C-RNC 12 may subsequently request WTRU capabilities from S-RNC 14 in a separate procedure, not shown for purposes of simplicity. The WTRU handover request is conveyed directly to WTRU 10, at step S3. Initiation of PtM service is conveyed to WTRU 10, at step S4.

[0038] Figure 5 shows exemplary WTRU capabilities in PtM activation with an optional subsequent capability procedure at steps S2 and S3, shown in dotted fashion. More specifically, when PtP services are in progress, WTRU capabilities are known to the C-RNC 12 and available capabilities for PtM services can be determined without need for PtM capability signaling associated with, or subsequent to, PtM initiation at step S4.

[0039] When PtP services need to be established and simultaneous support of PtM/PtP services is not indicated in WTRU capabilities, either a reception of the S-RNC 14 RL Setup procedure for Call Admission Control (CAC), or an alternative UTRAN procedure in the C-RNC 12, must result in release of the PtM service. In the case of RL Setup/CAC procedure, a successful response to the S-RNC 14 must release the PtM service. This can be accomplished by modifying the existing S-RNC 14 to WTRU 10 procedure (step S1) for establishment of the PtP service with explicit signaling, requesting that the WTRU 10 should stop reception of the PtM service, or by

implicit rules specifying release of the PtM service based on WTRU capability or stored configuration.

[0040] Figure 6 illustrates an example of the release of PtM services upon establishment when WTRU capabilities do not allow for simultaneous PtP/PtM support. As an alternative to the previous scenarios, the release of the PtM service maybe invoked by a new C-RNC 12 initiated procedure. A paging and notification channel is used to inform WTRU 10 of PtM service transmissions. This same channel can be used to notify the WTRU 10 of the termination of the PtM service to that WTRU or all WTRUs activated for that service, or in the newly established PtP link.

[0041] In the case of shared PtM and PtP capabilities, when PtP services need to be established, the C-RNC 12 may reduce the PtM capability requirement using a procedure similar to the PtM modification message in a manner shown in Figure 6. More specifically, with PtM service in progress, controlled by C-RNC 12, at step S1, S-RNC 14, determining a PtP service requirement, initiates an RL setup at step S2. C-RNC 12 responds, at step S3. The PtM capability is optionally modified at step S4, shown in dotted fashion to reduce PtM service and share PtM and PtP service when the WTRU is capable of the accommodating both PtM and PtP service. S-RNC 14 initiates PtP services by notifying WTRU 10 at step S5, through a paging and notification channel, thereby establishing PtP service and releasing PtM service. C-RNC 12 initiates PtP service, at step S6.

[0042] The foregoing invention is envisaged to be applicable without limitation to time-division duplex (TDD), frequency-division duplex (FDD), code-division multiple access (CDMA) and other modes of transmission. While this invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the scope of the invention.

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